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A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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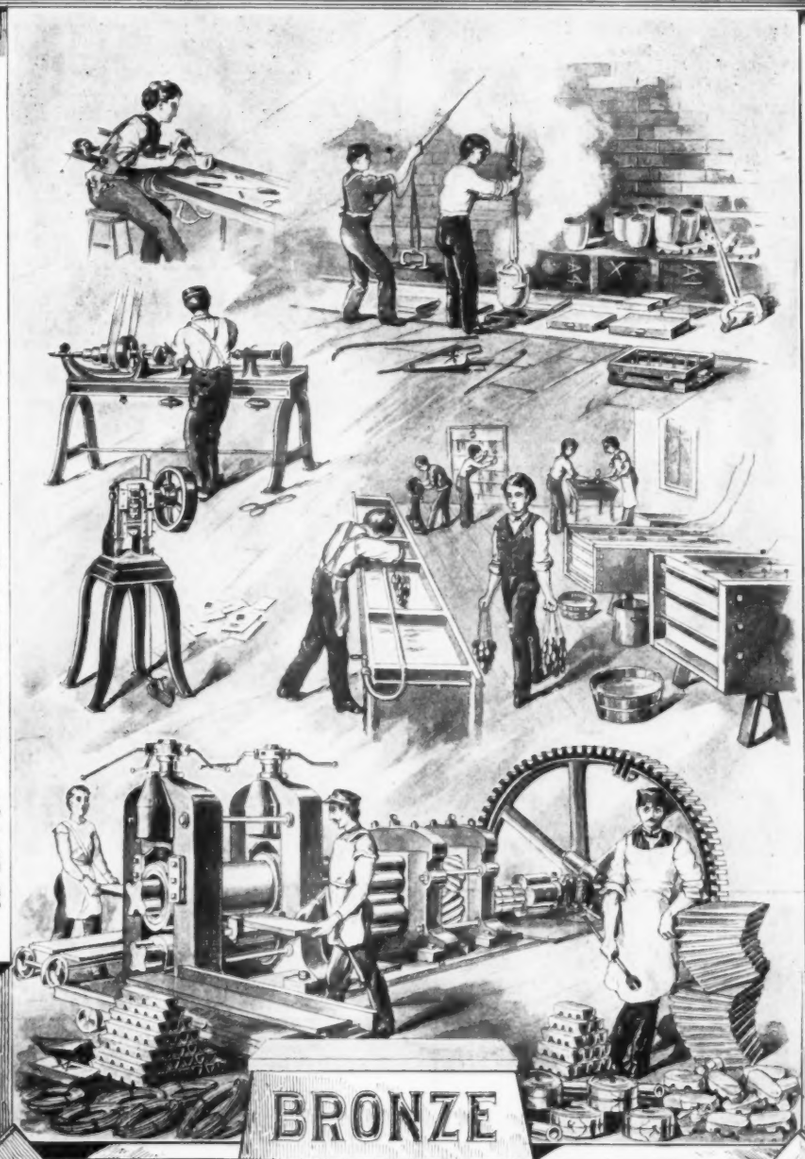

OLD SERIES Vol. X. No. 4.
NEW SERIES Vol. II No. 4.

LABOR OMNIA VINCIT
APRIL, 1904

NEW YORK.

61 BEEKMAN ST.

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, AND ELECTRO-PLATERS REVIEW

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THE METAL INDUSTRY
AND
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AND
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AND
ELECTRO PLATERS REVIEW

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THE DECLINE OF METAL FAKISM.

For the past few years there has been a gradual but steady decline in the number of metallic nostrums or secret alloys which have appeared upon the troubled seas of the metal world. Even the tempered copper man, an individual who in former times was almost irrepressible, has become quite a stranger. The chap with the non-corrosive white metal occasionally comes to the surface, but as the public fail to respond with the enthusiasm of the past, he soon sinks into oblivion. The anti-friction metal fakir has likewise almost become subdued and the day seems to have passed when antimonial lead costing between four and five cents a pound can be sold for twenty-five.

It is not difficult to understand this changing condition of affairs, and we are pleased to say it has been brought about by a better understanding of the properties of metals and alloys. The methods of analyzing and testing the qualities of metallic substances are now in such a satisfactory state, that there is little excuse for one becoming deceived if care is taken to investigate the subject at all.

The discovery is soon made that the so-called "tempered" copper is simply a sound copper casting with the same properties as that "untempered." Further investigation reveals the fact that the ancients, who some people believe to have been so abnormally wise, hardened copper by the addition of tin in exactly the same manner that is done at the present time. Beyond this "tempered" copper is a myth.

The non-corrosive white metal inventor usually receives his quietus in a short time, for the consumer soon finds that the material is no better than good grades of German silver. The white metals intended for sand casting invariably contain aluminum, as it was early discovered that this element is of great benefit in the casting of nickel alloys in sand. This fact was known early in the history of aluminum and for many years aluminum formed the "secret" of the white metal "discoverers." Many ingenious methods were resorted to in the endeavor to conceal the fact that aluminum was being used. As the presence of aluminum in nickel alloys is so readily indicated, the white metal containing it soon becomes of known composition.

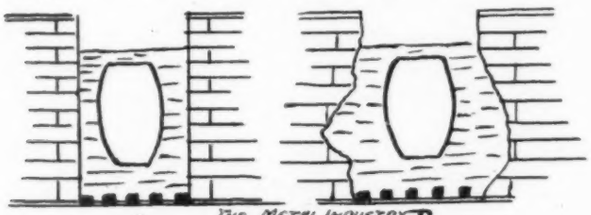
That the anti-friction metal industry should have become placed upon a business basis is natural. The early

makers, however, certainly "made hay while the sun shone." Thousand of dollars have been made by these people simply because of the fact that the consumer did not know the composition of his purchase. The day of secret compositions is rapidly passing and the most successful metal producer in the future will not be the one who has discovered mysterious compositions, but he who bestows the most care upon the manufacture of his product and pays the most attention to the small details which invariably react so favorably in the production of good wares.

THE SELECTION OF A PROPER FIRE BRICK.

To many, different grades of fire brick are unknown and there is assumed to be no dissimilarity except in outside appearance. They are presumed to come within the same category as the ordinary red brick in which practically the only requisite is appearance. In assuming that fire brick do not differ in quality the consumer errs to a great degree. There is fully as much difference in them as in the various grades of copper or of spelter and as much judgment should be used in their selection.

Let us take the case of the crucible furnace using coal or coke in which a grade of fire brick particularly adapted for the purpose is necessary. The furnace is lined with a cheap fire brick sold for boiler use or building purposes and purchased because there is a difference of a few dollars a thousand. Of course the furnace, when lined, has the appearance of any other (Fig. A), but in a short time



A B

the body begins to burn out (Fig. B), so that the amount of coal or coke which is necessary for packing around the crucible has increased almost twofold and actually continues to increase until the furnace is relined. It will be found that the fuel consumption in such an instance greatly overbalances the difference in cost of a fire brick suitable for the purpose. The consumer can well afford to pay the difference in price.

For crucible furnace use one must not imagine that nothing more than infusibility is necessary. Something more is required; the property of withstanding fluxing or corrosion. As a rule, a very infusible brick, like a silica brick, is quite soft and friable. The clinkers readily adhere to them on account of their being opposite in chemical nature and when this foreign material is removed by the clinker bar at end of the day's work, portions of the brick are likewise removed and the life of the furnace is, therefore, quite short. Bricks of the proper composition do not readily "clinker" but leave the furnace in a comparatively clean condition when the furnace is dumped. What is needed in a crucible furnace is a hard fire brick, with a smooth surface and close grain, of the highest heat-resisting nature possible in connection with the other properties, of a chemical nature as near as possible to that of the clinker so that there shall be no fluxing action and consequently no abnormal adherence of the clinker to the brick.

We believe that the consumer will not act unwisely if he tells the maker exactly what the requirements are and, if the latter is one who understands his business, he will be able to select the proper brick and one which will give the longest life under the required conditions. He must not believe that he is being cheated if a high price is asked. Good fire brick are not cheap and in the end economy will surely result.

CYANIDE VS. CHLORIDE IN THE SILVER BATH.

We find that there is considerable diversity of practice in the making of the cyanide bath for silver plating. Strictly speaking, the bath for silver plating consists of a solution of either the cyanide or chloride of silver in cyanide of potash. The chloride of silver is more frequently used than the cyanide for making up the bath, especially by those who do not produce the highest grade of plating, for the reason that it is much more readily made than the cyanide. We find, however, that the platers who produce the highest grade of work and that which wears the best invariably use the cyanide of silver. We occasionally come in contact with platers who maintain that the chloride gives equally as good results as the cyanide for making up the bath, but the work which they produce is not of a kind requiring the highest character of deposit and for them the chloride undoubtedly gives good results.

The reason for using the chloride of silver in making up a cyanide is quite apparent because of the ease with which it is made. When the chloride is dissolved in the cyanide of potash there is formed chloride of potash and cyanide of silver. It is the chloride of potash which renders this bath objectionable. Just what its action is does not seem to be well understood, but one reason, apparently, is on account of its action on the work. It is said that work plated in a chloride bath does not stand the burnishing nearly as well as that produced in the cyanide bath, but is much more apt to strip under the tool. The solvent action on the anode is also much less and it is much more difficult to keep the bath in an uniform working condition.

We do not desire to have every plater who is using chloride of silver for making up his bath believe that he must change to the cyanide, for in many cases the results are satisfactory as the class of work which is produced does not demand the highest refinement of the plater's art nor does it require burnishing. If, however, a class of work of the highest grade is desired the cyanide of silver must be used in making up the bath. Establishments which have the highest reputation for silver plated wares invariably use this substance in the making of their plating solutions, and if a plater who is now using chloride of silver for this purpose experiences any difficulty, we would certainly recommend that he adopt the standard practice.

ANNEALING IN STEAM.

That the first attempt to apply a fundamental invention to actual practice rarely succeeds, is demonstrated in the case of the process of annealing metals in an atmosphere of steam. That copper does not oxidize when heated in an atmosphere of superheated steam has long been known, but the first to make application of the fact appears to be George W. Cummins, of Vienna, N. J., who was allowed an United States patent* for a "Process of Preventing the Oxidation and Deoxidation of Copper When Heated." The attempt of Mr. Cummins to exploit this proces in the Naugatuck valley is well remembered, and at that time, his arguments in favor of the process met with practically no response. The matter lay dormant until recent developments along the same lines, appearing in the shape of an English patent, stimulated competition, and the Cummins patent was purchased and the owners now claim originality of invention.

The claim of Cummins was, viz.:

"In annealing copper and its alloys, the process of inclosing the same in an atmosphere of steam to the exclusion of the atmospheric air and heating the metal in the presence of said steam to the desired temperature before cooling, whereby both deoxygenation and oxidation of the metal are prevented substantially as and for the purpose set forth."

In connection with his invention, Cummins says:

"As is well known, copper or any alloy of copper when heated to redness in the presence of free oxygen readily oxidizes, and there is formed on the surface a coating or 'copper scale'—a black oxide of copper which is very undesirable, owing to the direct loss of copper and the difficulty and expense of its removal when necessary to be effected in order to obtain clean copper; hence the object of this invention is to prevent the formation of said oxide in the operation of annealing copper and its alloys. Marked advantages of this process are that even very fine copper wire may be produced of exactly uniform diameter in any desired quantity. When once oxide has been permitted to form, its removal entails great uncertainty as to the exact diameter of the finished wire. Large quantities of copper wire are now in constant demand for winding electro-magnets and such uses, the requirements being that the wire shall be exact in diameter, even to the one-thousandth of an inch or less. This process also prevents the deoxygenation of the copper which reducing gases effect, thus ruining the copper. All so-called pure copper having normally oxygen in its composition, according to the best authorities, removal of which oxygen renders the copper brittle, and which brittleness subsequent annealing will not remove. If the removal of this oxygen only resulted in leaving metallic copper, no harm would happen; but the fact is that, owing to the presence of oxide, some foreign metals—commonly such as arsenic and antimony—released of their oxygen, leaves them in their metallic state, in which condition they ruin the copper, whereas if preserved in the state of oxides they exert no appreciable deleterious influence. These foreign substances or impurities are present in electro-deposited as well as in other commrcial copper."

Mr. Cummins illustrates his patent claim as shown in Fig. 1. The letter A indicates a retort, preferably of fire-clay lined with copper "a"; B, a heating furnace for said retort provided with a chimney H; C, a tank or receptacle for holding water or other cooling liquid; D, a closed passage leading in the retort A to the liquid in said tank; E, an inlet pipe for steam; F, the cover or door of the retort, A; and G, an opening into the passage B and retort A for the insertion of the proper instrument or tool for drawing the articles of copper heated in the retort A from said retort to the passage D, whence they fall into the liquid in the tank C.

*United States Patent No. 429,892—June 10, 1890.

The working of the process is effected in the following manner, viz.: The tank C is supplied with liquid until it rises a few inches above the opening into the passage D. The retort A having been heated by the furnace B, steam from a boiler or any suitable resource is let in at E under sufficient pressure to cause an expulsion of the air contained in the retort A cut through the liquid in the tank C. When all said air has been replaced by steam, the door F may be open and the copper pieces or article to be annealed placed in a retort A. The door F being then closed, the copper is allowed to become heated in the retort; steam, in the meantime, being continuously passed therein at E. When the copper has

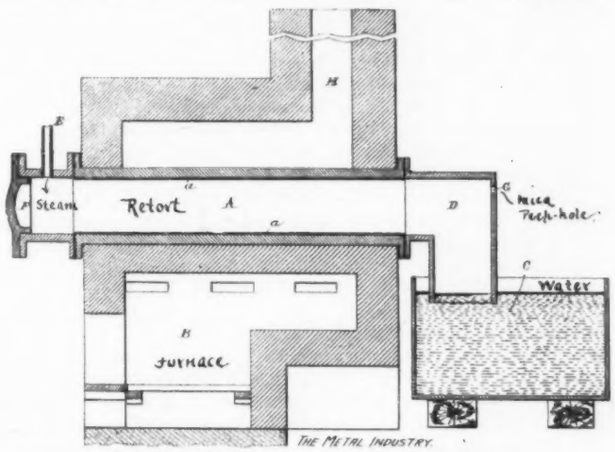


FIG. 1—CUMMINS FURNACE FOR ANNEALING IN STEAM.

attained the required temperature, a hook or other conveniently shaped rod is inserted through opening G, by which the articles of copper are drawn through the passage D, whence or through they fall into the liquid in tank C, in which the operation of annealing is completed. Steam of a moderate pressure may be employed, which will be superheated by the heat supplied to it while passing through the retort A.

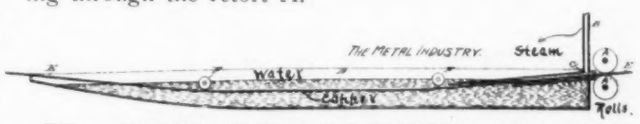


FIG. 2—CUMMINS METHOD FOR PRODUCING BRIGHT, HOT ROLLED COPPER.

In Fig. 2 is shown Cummins' method for preventing the oxidation of copper as it comes from the hot rolls. The sheet copper as it comes from the rolls is passed directly into a tank of water D. The pipe B is used to form an atmosphere of steam in immediate contact with the copper as it comes from the rolls. It is also stated that the rolls may be enveloped in steam.

The Cummins patent remained dormant for some ten years, that is, as far as the public is concerned, and it was not until the year 1902 that any attention was paid to it. The appearance of the Bates-Peard patent for annealing in steam then aroused much interest on account of its actually being used in England* for copper and brass annealing, and has, as will be explained subsequently brought about a statement from the owners of the Cummins patent claiming priority of invention.

The English patent known as the Bates-Peard method of annealing in steam is the invention of Darwin Bates, of Huyton, England, and G. W. Peard, of Prescot. The

*It is, we understand, in use at the mill of The British Insulated Wire Co., Prescott, England.

invention is also patented§ in the United States, and the inventors make the following statement in connection with their patent. They say:

"The invention has reference to the annealing of wire rods, strips, sheets or other forms of copper and other metals, and has for its object and effect to provide improvements in connection with annealing processes by which the surfaces of such metal, when burnished or bright, shall not deteriorate or be affected detrimentally during the operation."

"According to this invention, the apparatus by which this object and effect is accomplished comprises an air-tight chamber, tube or the like represented by 'a' in Fig. 3, the ends of which are elongated and are sealed or terminate in water, and air is excluded from this chamber or tube, and in some cases by filling it during the process of annealing with steam at boiler pressure temperature or super-heated steam, the pressure of steam inside the tube or chamber containing the metal to be annealed being slightly in excess of atmospheric pressure. The metal is conveyed through the chamber or tube on a mechanical conveyor in the form of an endless chain, belt or the like of suitable material, the hard unannealed metal being placed on a conveyor at one end, then mechanically drawn through first one water seal, then through the heated portion of the chamber or tube, and then out through the other water seal, by which it is cooled. The metal comes out of the apparatus soft and bright."

"In action, assuming the retort or chamber 'a' to be of the required temperature—say, red hot—and the air excluded, bright metal wire or bright metal or other form is placed on the conveyor 'e' within one of the tanks 'd' under water; by the motion of the conveyor it will be carried into one of the sealed mouths 'c' and to the retort or chamber 'a,' pased through it; in being moved at the required rate of speed it will become annealed and passes out, down the other mouth 'c' on the conveyor into the water, which will exist within the sealed end of this mouth. Hence it does not reach the air before it is cooled and below oxidizing temperature, and then it is carried forward through the water, and when clear of the mouthpiece it is taken away or discharged. The invention thus provides a continuous annealing apparatus of an automatic nature by which the oxidation of bright wire strips or other forms of metal can be readily annealed without oxidation."

The essential difference between the Cummins patent and the Bates-Peard appears to be in the mechanical contrivances of the latter for drawing the metal into the steam chamber and removing it without exposing it to the oxidizing effect of the atmosphere. In other words, Messrs. Bates and Peard appear to have begun where Cummins left off, and have made a useful application of the fact that an atmosphere of steam prevents the oxidation of copper and its alloys. There would seem to be no doubt that the Cummins patent is original in invention, and it certainly antedates that of Bates and Peard. The former was the first to make application of the well-known fact that copper does not oxidize in a steam atmosphere. Cummins seems to have encountered obstacles of a mechanical nature which prevented the successful application of the process in the manner that Bates and Peard have applied it. That copper does not oxidize in an atmosphere of steam has long been known, but the Cummins and the Bates-Peard process seems to have been the first to make a really useful application.

The only essential difference between the Cummins and Bates-Peard process appears to be that the latter had contrived ingenious means for inserting the metal into the annealing chamber while Cummins was obliged to insert his metal in the retort with the liability of oxidation while the process was being carried out. Bates and Peard have made the process actually continuous, and so that all kinds of copper and copper alloys may be annealed with a perfectly bright surface and with very small cost. The steam consumption is very low, for there is nothing necessary beyond the keeping of the retort filled with an atmosphere of superheated steam, and very little will escape if properly conducted.

The Bates-Peard process has not yet made its appearance into the United States, as it seems to be the undercurrent of general opinion that the Cummins patent covers the field, and that the former cannot be used in its entirety without infringing upon the latter. The Cummins patent is owned by the John A. Roebling Co. of Trenton, N. J., who have informed us that there seems to be no question about the originality of the Cummins invention, and that the rights will be fully maintained.

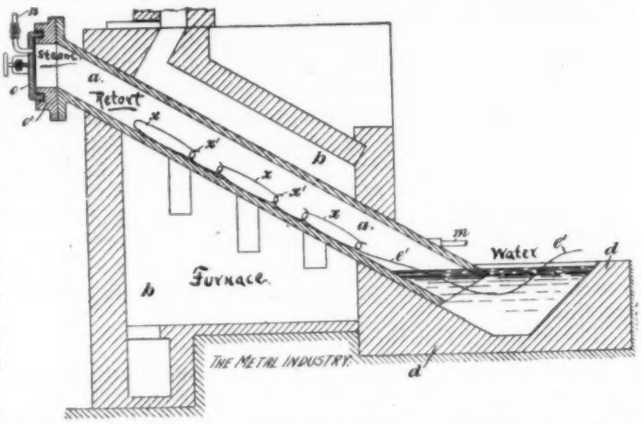


FIG. 3—BATES-PEARD FURNACE FOR ANNEALING IN STEAM.

The use of such an invention in the annealing of copper is very marked, as a large amount of copper is oxidized by the present method in annealing and scales off. This is not wasted, to be sure, as it has a market value, but there is bound to be more or less loss in addition to having an inferior product. There are several processes in use for annealing in an atmosphere of hydrogen or coal gas, and we believe that a combination of this and the Bates-Peard method might be used without danger of infringing on the Cummins patent. It would involve much more expense, however, and is, therefore, not as alluring as the use of steam.

ANNEALING TEMPERATURE FOR BRASS.

Referring to the microphotograph of cartridge brass, which appeared in our March issue, Mr. E. A. Lewis, of Birmingham, England, metallurgist for the Muntz Metal Company, writes to *The Iron and Steel Metallurgist* that the difficulty was on account of the metal being overheated during the annealing. It has, he says, every appearance of having been heated to 1,500° F., which would cause it to have the abnormal structure. Sheet brass, he states, containing 70 per cent. of copper should be annealed at about 1,200° F. and on no account should the temperature exceed 1,400° F.

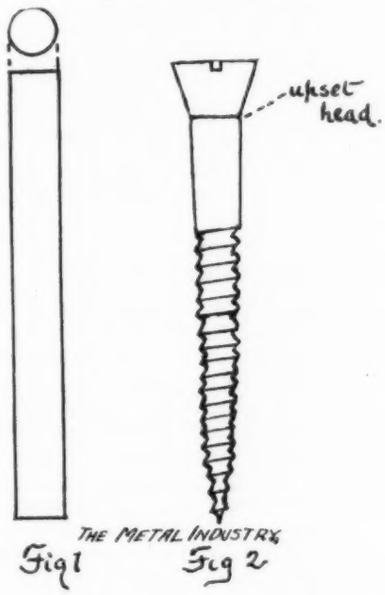
The more quickly metals are cooled from the molten state the finer the grain of the casting and the more homogeneous they become. This is why copper molds are used for making copper bars and ingots and also explains that fact that metals cast in sand will not roll. In the latter case the slow cooling produces a course crystalline structure in the metal which makes it break to pieces in the rolling.

§U. S. Patent No. 716,618—Dec. 23, 1902.

BRASS FOR WOOD SCREWS.

As lead is supposed to be an inseparable ingredient in screw rod or other brass intended for free cutting, it is a surprise to many to find that a brass wood screw contains practically no lead. One is apt to look upon the analysis with suspicion or that the brass manufacturer has not understood his business.

The wood screw question is different from the machine screw industry inasmuch as the former are invariably made from a rod the size of the shank of the screw and the head upset. In the majority of wood screws the thread is cut, although the head is upset, but in others the thread is rolled. In the machine screw, the head is usually left the size of the rod while the shank is cut down.



In Fig. 1 is shown the ordinary brass rod for making wood screws and in Fig. 2 the wood screw as made, indicating that the head has been upset on the rod. The following is an analysis of a commercial wood screw, viz.:

Copper	71.14%
Zinc	28.70%
Lead	.07%
Iron	.09%
Tin	none.

The amount of lead and iron in this material indicates that it comes from the spelter as it is about the amount which would be introduced from a good grade of this metal. The kind of metal that is needed in the manufacture of wood screws is one which will be ductile enough to stand the heading without splitting and, at the same time, be strong enough to withstand the torsional strain when it is screwed into the wood.

The annual convention of the American Foundrymen's Association will be held on Tuesday, Wednesday and Thursday, June 7, 8 and 9, in Indianapolis, Ind., and on Friday, June 10, in St. Louis, Mo. Secretary Moldenke states that an announcement will be made later about the railroad arrangements. The foundrymen are invited to bring their ladies, who are to be especially entertained during the convention. It is also hoped that the foundry and pattern foremen will be well represented, that the value of the discussions may reach as many as possible.

NEW PROCESS FOR DE-TINNING.

A new process of separating tin from tin scrap has recently been devised by an English inventor. The process is of some theoretical interest and differs from those hitherto proposed, in so much as the separation is brought about without the aid of acid or alkalies and depends chiefly upon voltaic action, aided by atmospheric action.

Coke is crushed to a coarse powder and saturated with a strong solution of common salt, any excess of solution above that required to saturate the coke being drained off, as it is important for the success of the operation that the air should be able to penetrate readily throughout the mass. The scrap to be stripped is covered with this moistened coke powder. It need not even be contained in any vessel or receptacle, as a mass of coke and scrap can be formed into a heap on the ground. The action commences very rapidly and is often complete in a few hours. To avoid patches of unstripped material on the surface of the scrap, it is well to cause the heap to be shaken from time to time, so that the whole of the tin surface of the scrap is brought into contact with the coke.

When the black surface of the scrap shows that the separation is complete the mass is washed with a jet of water, when it is found that the tin is washed out in the form of an oxide, probably in the form of hydrated stannic oxide, which forms a white, milky precipitate in the water, from which it can be collected by allowing it to settle, and subsequently filtering it off. No tin is found in the solution as chloride. The brine moistened coke can be used over and over again, so long as the heap does not become too dry, but when this is done the washing out of the tin oxide must be deferred until sufficient tin is contained in the heap to make it worth while to clean up. It is easy to separate the rough coke powder from the stripped scrap by means of a screen, and when this is done the coke may be allowed to fall into unstripped scrap; the stripped scrap left on the screen being then well washed with a water jet, as a large amount of tin oxide adheres to the surface.

The process was worked out for the separation of tin from town scrap, such as empty tins of all sorts and sizes. After well washing, these can be readily brought into contact with the coke powder, both inside and out, and a fairly complete separation of the tin obtained at a very cheap rate.

LEADED BRASS SCREW ROD CHIPS.

Large quantities of screw rod chips of yellow brass find their way into the market as a by-product in the manufacture of screws and other small articles made on an automatic machine. These chips are used by brass founders to a large extent and form a uniform and satisfactory material for the manufacture of alloys. All that is necessary, is to remove the iron by the magnet machine.

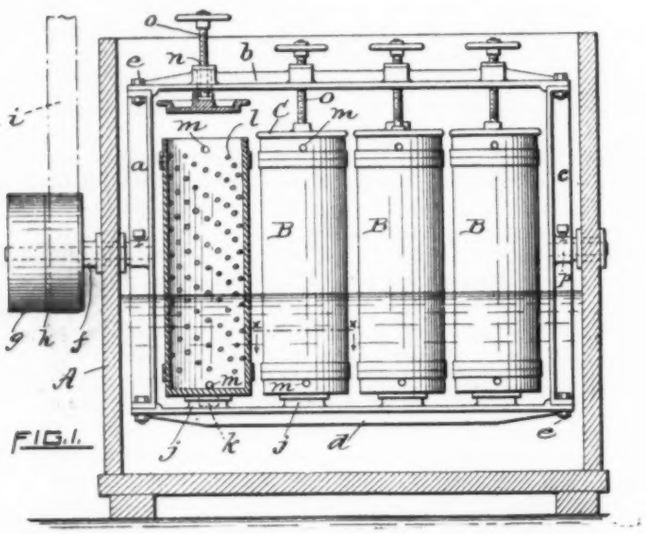
These screw rod chips are all approximately the same in composition as the makers of brass rod for free cutting all use practically the same mixture. The average composition is, viz.: Copper, 62 per cent.; zinc, 35.75 per cent.; lead, 2.25 per cent.; tin, none.

A company has been formed at Gas City, Kans., with a capital of $100,000 to manufacture zinc monuments. A $30,000 plant will be erected. As there are but two companies in the United States making zinc monuments and, on account of the demonstrated durability of zinc for this purpose, the promoters feel that there is a field for a new plant. Zinc monuments are now being put on the market under the name of "white bronze," but are composed of nothing but commercial spelter.

A NEW FORM OF TUMBLING BARREL.

A new form of tumbling barrel has been invented by James P. Bucklin, of Providence, R. I., which possesses several new and novel features. The barrel is intended for tumbling small brass work, jewelry findings and the like and may be used either for cleansing, polishing, or burnishing as the occasion requires.

A revolving barrel has hitherto been used for this purpose but is open to the objection that the articles are apt to accumulate in an interlocked spherical mass, the individual constituents of which are thus unlikely to receive treatment. The barrel invented by Mr. Bucklin is intended to obviate such difficulties as the construction is such that the conditions in the interior are quite different from those of the usual barrel.



In Fig 1 is shown the barrel and tank for holding it. A is a tank for holding the cleansing liquid. Rotatably mounted in the tank upon the horizontal shafts "*p*" "*f*" is a rectangular frame, composed of four metallic bars *a b c d* whose extremities are secured by bolts *e*. The frame is driven by the shaft *f*, which carries the usual fast and loose pulleys *g h*, actuated by the bolt "*i*." The lower bar *d* of the frame is provided with a plurality of rectangular sockets *j*, adapted to receive rectangular studs *k*, upon the bottom of cylindrical receptacles or holders B. The latter are provided upon their interior with spirally arranged knobs or projections *l*, and the walls are pierced *m*, at both ends to allow passage therethrough of the cleansing liquid. At intervals the upper bar *b* provided threaded openings *n* to allow passage therethrough of hand screws *o*, which removably engage the covers C of the holders B.

GERMAN SILVER BRAZING SOLDER.

A German silver brazing solder is often required and a brass founder or similar metal producer is occasionally perplexed if the subject is proposed. A good German silver solder may be made after the following proportions, viz.:

Copper	45 per cent.
Zinc	45 per cent.
Nickel	10 per cent.

The solder may be made in the same form as any brazing solder and has a white color. It is much lower in fusibility than German silver and, therefore, answers for brazing this material.

POPES ISLAND METAL.

This alloy was sold on the market at one time for the purpose of making non-corrosive white metals and castings. It was made by The Popes Island Corporation of New Bedford, Mass., who have since retired from business. The alloy has a good color and is quite tough and will stand much bending before breaking. The following analysis was made of a harness buckle, which had been cast in sand:

Copper	63.93 per cent.
Zinc	20.71 " "
Nickel	13.66 " "
Tin	.56 " "
Iron	.52 " "
Lead	.23 " "
Aluminum	.20 " "
Manganese	.19 " "

The alloy was chiefly sold for harness trimmings, and as it possesses a good white color and casts well on account of the aluminum, it forms a satisfactory alloy. The lead is present as an impurity and should not be added unless free cutting is desired. This alloy, as well as others of a simliar nature, were known as Howard's non-corrosive metals.

TWO NEW NICKEL ALLOYS.

Two new nickel alloys have been discovered and put to some use. The first is called "Invar" and contains 37 per cent. of nickel and the balance iron. After being subjected to special heat treatment, this alloy is practically unalterable in length under ordinary ranges of temperature, the expansion for one degree Fahrenheit being only 1-36 of an inch per mile. For use in the compensation balances of clocks and similar purposes requiring an alloy with the least expansion under heat, this alloy is beginning to be used.

The second alloy known as "Platinite" contains 46 per cent. of nickel and the balance iron. This alloy has the remarkable property of having the same co-efficient of expansion as glass and may, therefore, be substituted for platinum in the use of incandescent lamps. It has already come into use in the manufacture of Appert's armored glass in which a wire network is sealed in the glass. Ordinary metals will not allow glass to be sealed around them as the difference in the co-efficient of expansion causes the glass to break when the mass cools.

BRONZE GUNS IN AUSTRIA.

In a pamphlet recently issued by the Austrian War Ministry a new gun for the artillery is described. It is stated that Austria is now the only country which employs bronze for its heavy guns, all the other countries use steel. The bronze is forged by a secret process by which a strength equal to that of nickel steel is said to be given to it. The cost of the inner tube of the gun is said to be three-fourths that of a steel tube. It is also said that an injured bronze gun can have a new jacket fitted to it which is impossible with a steel one.

These statements are quite interesting in the face of the fact that the leading nations have abandoned bronze in favor of steel. The process used for obtaining the high strength mentioned will be interesting when known. Facts are necessary, however, before conclusively accepting these statements.

Antimonial lead is a by-product in the manufacture of silver and hence can be sold at a lower price than a mixture of the two constituents made from new metals.

BRASS PLATING SOLUTIONS, THEIR USE AND ABUSE.

By F. P. Davis.

All things considered, brass plating is the most perplexing and most difficult work that the plater is called upon to accomplish. The deposition of two such dissimilar metals simultaneously in one bath and in different proportions (copper depositing under a weak current while zinc requires a strong one) was a problem long considered impossible. It has been for several years, however, a very practical process and large quantities of soft metals, zinc, and iron wares are brass plated and frequently used in connection with solid brass on the same object without any noticeable difference in appearance. A comprehensive knowledge of brass plating is essential to any plater and may be possessed by many of them. Individual opinions differ widely and many have practices and minor processes peculiar to themselves, but the fundamental facts are the same in most all instances.

Brass solutions may be properly classified, viz.: First, those suitable for heavy deposits; second, those for light bright deposits to be lacquered with no further finish. It is the purpose of this article to describe them both and those most suitable for plating iron as nearly all other metals may be plated in the solution used for this purpose. Both baths should be made from freshly prepared carbonates of copper and zinc; two parts of weight of the former and one part of the latter, which in turn are best made from pure high grades sulphates of copper and zinc. Carbonate of copper is prepared as follows, viz.: A quantity sufficient to allow five or six ounces to the gallon of solution is placed in a proper receptacle. A wooden tub makes a good one. Enough hot water is added to dissolve it, or nearly so, with frequent stirring to bring up the saturated solution surrounding the crystals. Take a pitcher of fresh crystallized sal soda and fill with hot water, which will quickly become saturated, and pour the liquid into the copper solution, care being taken to add slowly that the mixture does not boil over, as it is likely to do at first. Continue until the copper is entirely precipitated and the resulting light green precipitate of carbonate of copper has settled into a mass at the bottom. Decant and wash repeatedly until no trace of acid or alkali remains. Use hot water for washing. The advantage of hot over cold water is the expedition given the process and the density of the precipitate produced thereby.

In the meantime the vat that is to contain the bath should be half filled with pure water in which six or seven ounces of pure cyanide of potash per gallon of the solution has been dissolved. Now add the copper carbonate, slowly stirring in the meanwhile to dissolve it without the production of sediment.

The carbonate of zinc should be prepared in the same manner as the carbonate of copper and dissolved in cyanide (no more being used than is necessary) in a separate tub and then added to the vat containing the already prepared copper solution. Now add aqua ammonia of a good grade at the rate of one gallon to a hundred gallons of the brass solution, fill up the vat to the required depth, add a small quantity of cyanide for "free" cyanide, if necessary, and the bath is ready for use.

The bath should be used warm and at a temperature of from 100 to 110 degrees Fahrenheit and heated by a steam coil of three quarters of an inch steam pipe. It may be well to state that these proportions are approximate and may best be left to the individual judgment of the plater.

The solution should stand at five or five and a half Beaumé, and any degree of density above this will not yield a bright deposit after the color is flashed on. The addition of a very small quantity of pure, white arsenic dissolved in cyanide will tend to brighten the deposit, but much depends upon the purity of the arsenic and great care should be employed not to use too much. It is a good friend but a bad enemy and hours may be required to get the bath back into a fit condition if it is overdone. The plater should not be discouraged if the first results are not entirely satisfactory. It is more apt to be the rule than the exception that a new bath needs coaxing to get it into good condition.

The anode surface should be equal or in excess of that of the cathode, and in starting off a new solution it is advisable to put in a small amount of work and allow the current to run for a time, which will tend to thoroughly mix and assimilate the solution.

The anode should be of first quality of clean yellow brass, annealed as soft as possible and suspended by heavy brass hooks formed "S" shaped. They should always be removed from the solution when not in use. This is important. They should be acid dipped before commencing work. The current should be double or more of that required for an equal amount of nickel solution.

The work should not hang nearer than five or six inches to the anodes and care should be taken that a small quantity of the work does not hang much nearer than the majority of it. Much care is needed that the connections are kept clean and free from corrosion, both from contact with the solutions and vapors arising from it. A sheet of this brass bent down over the anode rod and hooks is a good device for protecting them from the dripping. The care and maintenance of the brass solution will try the plater's skill. I have turned out twelve or fifteen barrels of small iron articles from a single solution, that went directly to the lacquer bench with no further finish, and realize the difficulty of keeping such a solution in good condition.

When worked at a high pressure the bath will require constant watching and frequent feeding, but do not over do the latter. When working its best the anode should present a gray appearance over most of its surface and not much corrosion or coating. When a heavy, hard coating gathers the bath needs cyanide.

Additions of copper carbonate should be dissolved in cyanide and additions of carbonate of zinc, unless a large quantity is required, which is seldom the case, should be dissolved in aqua ammonia. The material for renewal should be kept constantly on hand but none used over a week old. This material should be kept covered with water and not allowed to become dry. The need of zinc is noticed by a dullness of deposit and a reddish tint on the parts of the work furthest away from the anode. Parts that are overlapped, for instance, while a bright pink color on the work at the end of the tub and on the parts nearest to the anode, that getting the most current, denotes a deficiency of the copper. It is best to heed this warning promptly; the next indication will be a sudden dullness of deposit and a greenish white color and breaking up that will require some time to correct. Small quantities of copper or zinc for renewal are best if added in season, as it takes but little to upset the equilibrium of the solution. It is best to make two or three additions rather than to have cause to regret the addition of too much.

From one to three minutes is sufficient to give a clean, bright color to smooth sheet metal work when the solution is at its best, and work should be hung on frame hooks rather than strung on wires on account of the ease and rapidity in which the work may be put in and taken out. When the work is removed it should be done rapidly as,

after part is removed, the proportion of anode and cathode surface is changed and a few seconds time is sufficient to alter the color.

Sometimes it is desirable to agitate the cathode rod slightly just before removing the work to brighten the color. The color should be a rich lemon which will darken under lacquer to the required shade. Anything approaching a deep yellow natural brass color will invariably turn too dark in a few hours. The color of the bath should show slightly milky when in use and foam freely, the top of the solution being entirely covered.

Small articles such as screws, etc., may be plated in wire baskets, but to get an even color and keep it on the articles first coated, after they have been shaken up to bring those not yet plated up to the effect of the current, requires a bath in perfect condition.

Solutions should be frequently decanted with a siphon and caution used to keep matter of a contaminating nature from coming in contact with them. If a bath becomes unmanageable through the addition of too much arsenic or gets into a condition of general "cussedness," undescribable otherwise, which will occur, take a heavy wire, bent up into a hook at each end and as long as the vat and hang horizontally on the cathode rod and just below the surface of the bath and allow the current to run two or three hours, which will usually clear it.

A bath made strong enough to stand eight or nine degrees Beaumé, used in a boiler iron tub and heated to 130 to 140 degrees Fahrenheit, is a very practical one for soft metal work, such as the feet and handles of mantle clocks, etc. If handled cleanly they may be taken directly from the casting bench and placed in the bath with no preliminary cleaning. The bright surface which is desirable will then be retained. They require about thirty minutes deposit and, after being well rinsed, should be passed through a slow acting, bright acid dip and then passed directly to the lacquer table.

The anodes must not touch the iron vat and the rods, both the anode and cathode should have a piece of rubber hose around them where they rest on the vat. Wooden supports soon become saturated from the drip of the work and will then cause a short circuit.

Brass solutions for heavy deposits are usually, but not always, run cold and should carry more metal in the solution than those intended for light deposits. Such solutions range from eight to fifteen degree Beaumé, according to the character of the work and the methods of the plater. It is not necessary to remove the anodes when not in use and no such degree of care is required to produce good work. These solutions require more strength of cyanide in proportion and should be clear and bright. The more dense the bath the less the gas given off at the cathode. If in the treatment to obtain heavy deposits the dull color prevails on the coating, the scratch brush or buffing will remove it and leave a bright finish.

In a general way the foregoing remarks concerning the care and maintenance of the bath for bright deposits will apply for heavy ones. From thirty minutes to an hour and a half is about the range of the time of deposit.

The bright deposit described in the first part of this paper will stand coloring on a soft buff if it is clear and bright, while for first-class lamp work to be gold plated, imitation bronzes, and heavy iron work of a fine quality a solution for giving a heavy deposit is used.

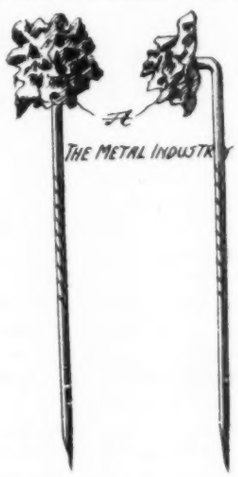
Bronze solutions are very similar to brass solutions both in the making and in the care and handling. A lesser quantity of zinc is used and varied to suit the color required. The addition of four ounces of sulphate of ammonia per gallon in the bronze bath is recommended by some in place of arsenic.

The remarks on drying work described in THE METAL INDUSTRY August, 1903, and those concerning the preparation of work for the nickel bath in February, 1904, apply equally as well to work for the brass or bronze bath.

ARTIFICIAL GOLD NUGGETS.

Gold nuggets are much sought for scarf pins and other articles of jewelry, but they are very scarce in large size masses. Ernest F. Bennett, of Colorado Springs, Colo., has recently patented a method of making artificial gold nuggets which indicates that, if one desires a nugget about which there shall be no question, he must actually find it himself in the natural condition.

Mr. Bennett melts the gold in a crucible and pours it into a loose mass of clay. The roughness of the clay imparts a natural appearance to it. The appearance of the artificial nugget when mounted as a scarf pin is shown



in the sketch. Mr. Bennett also says that he makes imitation gold nuggets by melting equal parts of copper and yellow brass and pouring into the rough clay. Instead of clay he often uses crushed quartz, which imparts a still more irregular appearance than the clay.

In order to have each artificial nugget of approximately the same size and weight the gold or brass is rolled into sheets of uniform thickness and then cut into pieces of the required size. These pieces are then melted and poured into the clay or quartz, when the artificial nugget of standard size and weight will result. In order to have the brass nugget appear natural it is gold plated.

ANNEALING SILVER ANODES.

It is customary to anneal silver anodes before using them in the plating bath It is the current belief that this is done so as to raise the conductivity, but as a matter of fact the anneadling is done for a different purpose. All metals require oil on the surface when rolled, and in the case of silver anodes both sides as well as the edges become covered with it. Any imperfections, too, become filled with oil. Such oil would contaminate the plating bath and the most certain method of getting rid of it is to anneal the anode before shipment. As far as the conductivity is concerned there is no need of increasing this property in the case of silver, as it is itself the best conductor of electricity known. The difference between the conductivity of hard rolled and annealed silver is only about two per cent.

The fifth general meeting of the American Electrochemical Society will be held at Washington, D. C., April 7, 8 and 9.

A MACHINE FOR MAKING WIRE SOLDER.

Large quantities of wire solder are used in the arts in the various operations of soldering, as this material in such a shape forms a very convenient means of introducing a uniform amount of solder on each article.

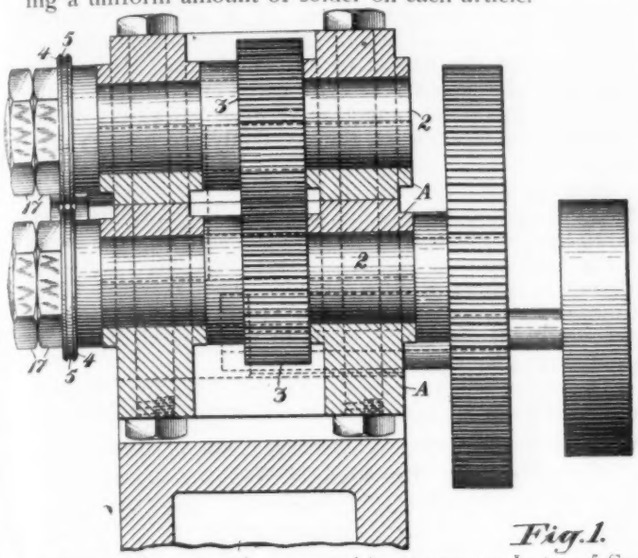


Fig. 1.

A machine recently patented by Augustus Lotz, of San Francisco, Cal., and owned by The Pacific Metal Works, of the same city, deserves attention. The machine takes crude solder as it comes from the mold in which it was cast and cuts and forms it into wire of any required diameter. The strip is then ready for coiling. Although the sketch shows the machine intended for making round wire, that of any cross section—triangular, flat or half round—may be made.

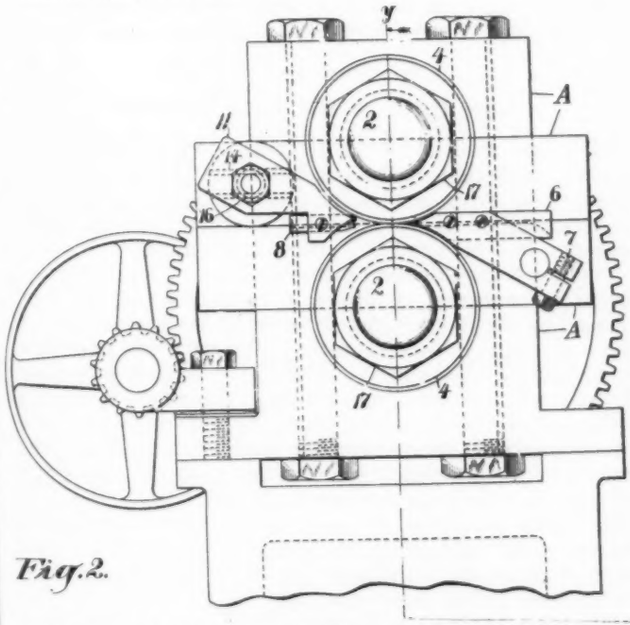


Fig. 2.

The machine is shown in Fig. 1 and Fig. 2 and resembles a slitter for slitting brass sheet. The bar is cast in as long lengths as possible and of the required section and is passed into the knife and forming rolls 5 through suitable guides. A trimmer, 8, separates the fins and leaves the solder wire free from any imperfections. The speed of the disks and the feed are capable of being adjusted to one another, so that the wire may be fed as fast as the cutting rolls will take it.

THE MANUFACTURE OF SOLDERING FLUX.

The standard flux for soft soldering is chloride of zinc and, simple thing that it is, there are many who are ignorant of its use or existence and likewise many who do not understand its preparation.

The theory of the flux is its ability to dissolve the oxide which exists as a film on the surface to be soldered. Metals will not adhere to one another unless perfectly free from oxide.

To make the flux proceed as follows, viz: Place some scraps of zinc sheet in a convenient receptacle, such as a stone crock, pitcher, bottle or other vessel of stone, crockery or glass. Metal will not answer, as the acid will act upon it. Now cautiously pour muriatic acid (hydrochloric acid) on the zinc, but do not add too much at once, as the action will be so violent that the mass will boil over. When the action ceases add more acid and continue to do so until *nearly* all the zinc has been dissolved. A little zinc should be left in the bottom to indicate that the acid has been exhausted. An excess of acid is not desirable.

Small black flakes of precipitated lead will be found floating around in the solution, as all spelter contains lead. Allow to settle and pour off the clear liquid into bottles which should be furnished with glass stoppers as cork is acted upon by the liquid and the organic matter produced contaminates the solution. Do not leave any undissolved zinc in the solution, but pour off as directed. If the zinc remains in the liquid a white precipitate will form, which interferes with the results.

Do not add any water to the solution, as the best results are obtained by using it strong. Water does not dissolve the oxides and it has to be evaporated by the soldering iron before the chloride of zinc begins to act. Do not use a wood stick or rag for putting the soldering acid on the work, as wood or any material of a like nature is gradually acted on by the fluid and contaminates the solution with organic matter. This organic matter may be noticed by a black film forming on the surface of the work when the acid is used and seems to act injuriously in preventing the quick adherence of the solder. A copper wire upon which fine asbestos has been bound is good, as well as a glass rod, with or without the asbestos. Use the soldering acid strong and keep it free from dust or dirt and, at the same time, free from contamination as above mentioned, and you will have a soldering acid which will give you excellent results.

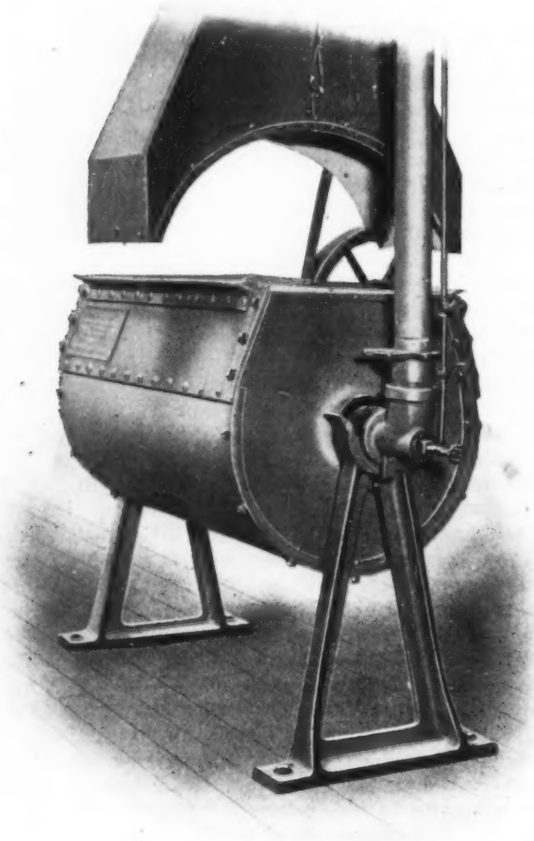
ELMORES GERMAN AND AUSTRO-HUNGARIAN METAL COMPANY.

The following statement in regard to this company was recently made in an English trade journal, viz: "At a meeting of the shareholders of Elmores Austro-Hungarian and German Metal Company, the managing director, Mr. Harry Ellis, stated that they found the manufacture of small tubes by the Elmore electrolytic depositing process to be the most expensive part of their trade. The practice hitherto has been to deposit a 4-inch tube and then draw it down through dies to the smaller diameters required. The directors, on this account, have decided to confine future operations to the production of tubes of large diameters, but have arranged for the installation of a trial plant for the production of small tubes by a process which has been developed in America, which, we understand, is a mechanical process of drawing down copper blanks or shells to form the smaller size tubes."

Antimony is a metal to be avoided in the manufacture of brass and bronze. A slight admixture of antimony will make the castings "rotten" or lacking strength.

THE ORBISON OSCILLATING BRASS FURNACE.

The Orbison oscillating, melting, mixing and refining brass furnace has recently been put on the market by W. T. Garratt & Co., of 138 Fremont street, San Francisco, Cal. This furnace embodies some excellent features not found in any other furnace. In tilting furnaces of this type using oil for fuel difficulty is experienced in mixing the charge, and for this reason metal not properly mixed often results with its accompanying difficulties. In the Orbison furnace a special device enables the furnaceman to mix his metal as thoroughly as it would be if crucibles were used and with less labor.



THE ORBISON FURNACE.

By means of a rocker arm an oscillating motion is given the furnace after the metal begins to melt and can be easily controlled by a clutch. The rocking motion imparted to the furnace not only mixes the metal thoroughly but aids the melting. In addition to the rocking device the furnace possesses another feature which no other furnace has. A series of "bull-head" brick are set the full length of the furnace at the bottom so that a dam or barrier is formed for the metal to run over. This greatly aids the mixing.

The furnace is lined with fire brick of the usual shapes so that they may be obtained from any regular dealer and expensive special shapes do not require to be manufactured.

Recent tests of the fuel consumption made by the makers show that 100 lbs. of metal can be melted with 2 gallons of oil. The loss of metal has been found to be less than 2 per cent. The furnaces are furnished in three sizes, viz., 350 lbs., 600 lbs., and 1,200 lbs. capacity.

THE PROSPEROUS CLOCK INDUSTRY.

In booming the stock of a new clock company a Connecticut paper makes some statements about the clock industry which are interesting. Few industries can compare in profits with those of the clock companies. They are all large and prosperous. It is an open question whether the consumption of brass in the manufacture of clocks is not the largest of any single use. It is often said that the manufacture of cartridges consumes the most, but this point cannot be verified. If clocks do not consume the most brass, they certainly are next to cartridges.

With two exceptions, all the clock factories are situated in Connecticut, and one of these, The Ansonia Clock Company, originated in Connecticut and was conducted for a long time at Ansonia, Conn., but later moved to Brooklyn, where it now stands. The Howard Clock Company, the other "outsider," is in Boston; so that practically all the clocks made in the United States are produced in New England.

The paper which we speak of above gives the following rating of the clock companies in the commercial agencies:

Waterbury Clock Co., Waterbury, Conn.....	$1,000,000
Ansonia Clock Co., Brooklyn, N. Y.....	1,000,000
Seth Thomas Clock Co., Thomaston, Conn...	750,000
The Ingraham Clock Co., Bristol, Conn.....	750,000
The New Haven Clock Co., New Haven, Conn.	750,000
The Sessions Clock Co., Forestville, Conn.....	300,000
The W. L. Gilbert Clock Co., Winsted, Conn..	300,000
The E. Howard Clock Co., Boston, Mass.....	125,000

This is certainly a good showing for an industry which seems to an outsider insignificant. It also indicates the ingenuity of the Connecticut Yankee.

The Waterbury Clock Company alone is said to turn out over 3,000,000 clocks a year. Statistics show that 1,000,000 clocks are destroyed by fire every year.

A NEW TRICK IN THE JUNK INDUSTRY.

The junk trade is filled with tricks, dodges, and devices for the deception of the purchaser; in fact, it embodies nearly everything in this line from deliberate stealing up. A new method of deceiving the purchaser has been discovered, that of "sanding" yellow brass chips.

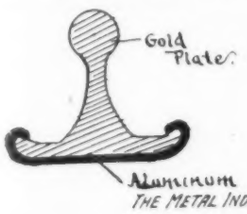
Yellow brass chips and material of a very similar nature occur in enormous quantities in commerce and are purchased by the foundryman for making brass castings. A junk man was noticed recently with a cart load of yellow sand backed up against a carload of a mixture of yellow brass screw rod chips and pin dust. The whole was being mixed carefully with a shovel and seemed to "blend" well. An examination showed that the sand had become covered over with the fine yellow pin dust and rendered each grain of sand similar in appearance to yellow brass. Pin dust and similar materials are quite greasy and easily adhere to the sand. Probably a ton of sand was mixed with the carload of chips. The result, to the naked eye, was that of uniform yellow brass material.

We afterwards came in contact with another sample of yellow brass chips which had been "doctored" in the same manner, but in this case fine slag had been used. To the eye, all seemed to be metal. An analysis gave 30 per cent. of slag. Of course an analysis will show this adulteration, but if the foundryman wishes to do the job himself, he can dissolve the chips in acid and observe the residue. Clean brass chips will almost completely dissolve in nitric acid.

SURGEONS' METAL.

Few persons care to invest in a solid gold collar button. First, it is expensive; second, it is seldom that a person possesses the requisite memory to prevent it going to that place from whence no collar button ever returns—the laundry.

It is to be regretted that nearly all the gold plated collar buttons are of an inferior quality; probably from the fact that one expects to buy a collar button very cheaply. The plate soon wears off, and the brass coming in contact with the flesh produces green discoloration, and oftentimes actual poisoning. A makeshift is to put a layer of celluloid on the back, but the difficulty is to keep it on, as it soon comes off.



Aluminum is now being used for such backing where the metal comes in contact with the flesh. Some genius has dubbed it "surgeon's metal." It is a laudable use, however, but all the buttons except the head should be made from it, as the cloth of the garment is soon colored by the brass as well as the skin. Aluminum is not poisonous like brass, and cannot produce poisoning under any circumstances. In the cut is shown the method of using the aluminum. A thin sheet is simply put over the back of a collar button made in the usual manner.

DIFFICULT ZINC ROLLING.

The Matthiesen & Hegeler Zinc Company, of La Salle, Ill., have recently performed a difficult piece of rolling which shows the character of their metal and their ability to meet the demands of the trade. This company received an order for some No. 1 gauge zinc sheet and actually rolled a large amount of this thickness with good success. As the gauge used for gauging zinc sheet is diametrically opposite to that of the brass makers, the gauge of No. 1 zinc sheet is only .002 of an inch. This is equivalent to a thickness of above No. 40 of B. & S. gauge or is really foil.

It may be of interest to state that The Matthiesen & Hegeler Company were the first company to roll zinc in the United States and made the first sheet in 1866.

The United Lead Company, of New York City, have secured a site at Perth Amboy, N. J., where they will build large works for the manufacture of white lead, shot, lead pipe, etc.

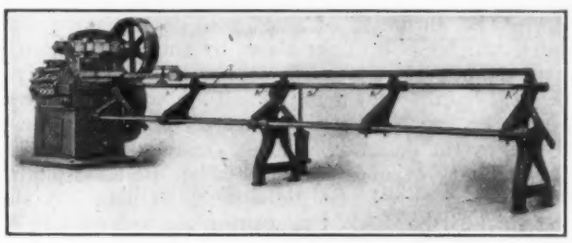
The Warner & Swasey Company, of Cleveland, Ohio, have completed the new addition to their works. The building is a one-story erecting shop, of modern fireproof construction, and is provided with an electric traveling crane.

The International Silver Company, of Meriden, Conn, are sending out illustrations of a New England jewelry store as it appeared in 1851, when established by Jones, Ball & Poor, at Summer and Washington street, Boston, Mass.

At the annual meeting of the National Lead Company the old Board of Directors were re-elected and amendments to the by-laws were approved providing that the annual meeting shall hereafter be held on the third Thursday of April. The net earnings of the company for 1903 were $1,569,069. During the year the company paid four dividends of $260,820 each.

SHUSTER MACHINERY.

The accompanying cut shows the new sheet metal straightener manufactured by The F. B. Shuster Company, of New Haven, Conn. The company have manufactured wire straightening machinery for a number of



SHUSTER SHEET METAL STRAIGHTENER.

years which is used largely by the rolling mills. It is expected that the sheet straightener will prove to be equally useful and necessary as a part of rolling mill and sheet metal factory equipment. Besides the straighteners The Shuster Company manufacture power cutters for foundries.

A NEW BRASS AND COPPER TUBE COMPANY.

A company under the leadership of George H. Clowes, formerly of Randolph and Clowes, of Waterbury, Conn., has purchased the Ellwood Tube Works, at Ellwood City, Pa., a short distance from Pittsburg, and will commence the manufacture of brass and copper tubes. The new company will be called the Clowes Brass and Copper Company. Mr. Clowes has been identified with the brass and copper industry for many years, and his experience in this line will be valuable to the new company. The company is capitalized at $1,000,000, and Mr. Clowes is said to be the principal stockholder.

AMERICAN BRASS COMPANY ELECTION.

At an election of officers of The American Brass Company, held in Waterbury, Conn., on February 23, the following officers were elected, viz.: President, Charles F. Brooker; first vice-president, E. L. Frisbie, Jr.; second vice-president, A. A. Cowles; third vice-president, J. S. Elton; secretary and treasurer, J. P. Elton; assistant secretary, James A. Dougherty; directors: Chas. F. Brooker, E. L. Frisbie, Jr., A. A. Cowles, J. S. Elton, J. P. Elton, Jas. A. Doughty, John J. Sinclair, Edward Holbrook, T. B. Kent, T. B. Burnham, E. T. Coe, C. H. Dodge, C. N. Wayland, D. Willis James, G. W. Burnham.

THE DAMASCUS BRONZE COMPANY.

As mentioned in the March number of THE METAL INDUSTRY the Damascus Bronze Company, of Allegheny, Pa., have bought the adjoining property to their foundry known as the Martin Hardsocg Manufacturing Company, which was destroyed by fire. The dimensions of their new property are 75 feet front, 170 feet deep, which will give the Damascus people double their present capacity for foundry use. They are about to erect a large building with a Pompeiian brick front, structural iron roof with the eves twenty feet high. They have received such a large number of orders from railroads for their Damascus nickel bronze that they have had to seek new quarters. They have just received one of the largest orders for babbitt metal ever placed in the United States.

Mr. F. L. Dutton writes us that the Harrigan Sectional Bearing Company, recently incorporated in Maine, will probably do business in Detroit, Mich. John F. Haring and A. M. Tracy, of Detroit, and N. S. Mousarret, of Toledo, Ohio, are the incorporators, with a capital stock of $100,000

The American Zinc and Chemical Company, Denver, Col., recently incorporated with a capital stock of $750,000, will build a plant for the reduction of zinc ores.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—The method of producing a rose-gold plate is desired.

A.—The formation of a red gold deposit upon electroplated articles is brought about by the introduction of a small quantity of a cyanide copper solution directly into the gold bath. Add it in a small amount at a time until the proper tint has been produced. This point can only be told by the operator and any shade may be produced. The ordinary cyanide copper solution used for plating is all that is required and the usual gold bath. A strong current must be used in depositing the red gold in order to obtain the desired tint.

Q.—The method of tin plating steel knife blanks is desired.

A.—It is supposed that the blanks are bright and free from oxide. This condition is usually brought about by the operation of grinding, but if the blank is covered with scale and oxide it is necessary to resort to pickling. Use a mixture of 1 part of oil of vitriol and 4 parts of water. Allow the blanks to remain in it until all oxide is removed. It is conducive to far better results, however, if the blanks are ground and polished bright rather than pickled, as pickling does not leave a smooth surface.

The blanks are now immersed in the flux and allowed to remain until thoroughly covered. The flux is made by dissolving zinc in muriatic acid until no more metal will dissolve. The next operation is the first tinning. To carry out this operation the blanks are dumped into a bath of molten tin and stirred about until all parts are covered with the tin. Do not remove the flux before doing this, but leave it on. If washed off the tin will not adhere. After the blanks have been thoroughly covered with tin they are removed and separated so that they will not adhere to one another. The only requisite of this tinning operation is to get the blanks covered with tin. Lumps and rough surfaces do not matter, as they are subsequently removed.

The next operation is called "re-tinning" and consists in taking each knife blank separately and dipping it in a bath of molten tin so that all parts of the surface are evenly covered and the lumps and ridges formed during the preceding operation removed. The tin in this case is kept covered by melted tallow, while no covering is needed in the first bath. In the re-tinning operation the blank is held by tongs and when covered is quickly removed and "flirted" to remove the excess. This operation consists in simply giving the blank a quick throw in order to remove the drop on the end. The blanks are now cooled on racks.

Q.—A brass founder says that he has been trying to cast boxes for steam engine bearings and has had much trouble from shrinkage. One box weighs twelve pounds and the other eight. He has been using a miscellaneous assortment of junk, the composition of which is unknown. It was principally yellow brass scrap.

A.—We cannot understand from the sketch you sent exactly where your difficulty lies, but presume that you are casting the boxes face up. All parts of this description should be cast downward so that the dross and sand will float to the top of an unimportant part. The difficulty is probably in the use of scrap, as this material is a very variable quality. Yellow brass not only shrinks more than brass, but is the poorest bearing metal known. A bearing should be made of good red metal. If, however, you desire to use scrap, judgment must be used in its selection. Old valves make good castings and they are usually quite uniform in quality. It is by far the best method to use new metal, as the composition is then absolutely uniform. A good mixture for bearings and one which casts well is the following: Copper, 85 lbs.; tin, 10 lbs.; zinc, 2 lbs.; lead, 3 lbs. If the small castings which you mention are properly gated no risers will be needed, but it is usually well to put a small one on the highest part to allow the air to freely escape. If you find that you cannot cast without risers see article in the METAL INDUSTRY for February, 1904, on the use of risers.

Q.—A plater wishes the method of making bi-chloride of platinum used in oxidizing silver and other metals.

A.—Dissolve 1 oz. Troy of scrap platinum in 10 fluid ounces of strong nitric acid and 10 ounces of strong muriatic acid. The platinum should be put into a porcelain evaporating dish, the acid poured on and the whole warmed until it has gone into solution. A gentle heat must be used in this operation, otherwise the solution will boil over. When all the platinum has been dissolved, evaporate the whole nearly to dryness or so that the mass is pasty, which will remove all the excess of free acid, and then add 10 fluid ounces of water until all dissolves. Filter through absorbent cotton if necessary and keep in well stoppered bottles. The above method will give a 10 per cent. solution, which may be diluted for further use as required. The 10 per cent. solution, however, is a convenient strength for a stock solution.

Q.—A brass founder states that he has been troubled in making a good red metal which will turn freely. A satisfactory formula is desired.

A.—Lead is necessary in a free working alloy and unless present in the proper amount the metal will be tough and unsatisfactory. A good alloy which works freely and is sufficiently strong for valves and cocks consists of: Copper, 87 lbs.; tin, 5 lbs.; zinc, 5 lbs.; lead, 3 lbs. It casts well and is an excellent mixture for nearly all classes of work.

Q.—A manufacturer of ornamental brass work says that he has made some candelabra of a mixture of 83 copper, 7 tin, 5 lead, and 5 zinc. The specifications called for "golden bronze." The castings were pickled and then polished but have now tarnished. He believes that they should be dipped and then lacquered and desires information about this.

A.—All brass or bronze work will tarnish if not lacquered, and were it not for this fact the lacquer makers would not thrive. If you desire to dip them, the following dip may be used: Two parts of oil of vitriol and 1 part of yellow aquafortis and a little common salt. This will not give a polished surface and for large castings is hardly advisable as imperfections become very conspicuous under this treatment. Your mixture is too high in lead. A large amount like this is unnecessary for ornamental work and is apt to segregate in spots. Do not use over 2 per cent. You will find polishing better and after lacquering a permanent character is imparted to the work. Use only the best lacquer.

Q.—What kind of oil should be used in casting brass, and is it suitable for using on aluminum?

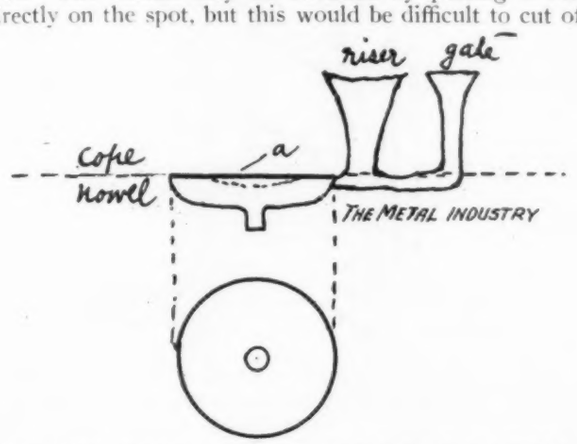
A.—Either lard or fish oil is the standard kind for use in brass casting but is, of course, only used in casting plates or bars for rolling. These are always cast in iron molds. Oil should not be used in sand casting as it is a detriment. Oil is quite unsuitable for use in casting aluminum and its alloys and must not be used on the mold under any consideration.

Q.—I have experienced difficulty in soldering brass to zinc. I use muriatic acid for a flux and half and half solder. The joint shows a rough, sandy appearance around the solder. Will you kindly inform me how the joint can be kept smooth.

A.—The difficulty lies in the use of muriatic acid. This acid acts so violently on zinc that there is considerable dissolving action before the soldering has been completed and the surface has the rough appearance which you speak of. Use the ordinary zinc chloride flux made by dissolving zinc in muriatic acid until no more dissolves. This gives a flux which will not act on your zinc but will allow the solder to flow readily and adhere.

Q.—An aluminum founder says that difficulty has been experienced in making an aluminum casting about four inches in diameter with a boss on one side. A shrinkage takes place on the flat side underneath the boss which ruins the casting. The shrinkage is shown in "a". An ordinary method of gating was used.

A.—The shrink may be obviated by placing a riser directly on the spot, but this would be difficult to cut off.



The method which is shown in the sketch is preferable as the riser may then be cut off with the gate. Let the riser be next to the casting and come through the cope. *Put a larger riser on.* A small one will be worse than none at all, as it will draw from the casting. Do not be afraid of getting the riser too large. It is your only salvation. The idea is to have the casting feed from the riser. These instructions apply equally as well to the other castings that you mention as to this one. The feeding principle is the same.

Q.—A subscriber wishes to know whether a bronze anode is used in a bronze solution for bronze plating.

A.—Use a bronze anode. Rolled bronze anodes may be obtained from brass manufacturers or from dealers in platers' supplies who advertise in our columns.

Q.—A silver manufacturer askes for a solution for oxidizing silver.

A.—Silver may be oxidized in two ways. First, by means of liver of sulphur solution, and, second, by the use of a weak solution of chloride of platinum. The liver of sulphur solution is made by dissolving 2 oz. of liver of sulphur in 1 gallon of water. The solution will give a deposit which will rub off if too strong.

The platinum solution is made by dissolving 1 part of chloride of platinum in 100 parts of water. This may be used cold. For a description of the use of this platinum solution for oxidizing silver see THE METAL INDUSTRY, June, 1903, p. 85.

Q.—The best mixture for globe valves is desired and a method of obtaining the fine orange color on them free from stains.

A.—The following is a standard mixture for valves and is in use by nearly every brass valve manufacturer:

Copper	10 lbs.
Tin	¾ lb.
Zinc	½ lb.
Lead	5 oz.

This mixture gives a strong alloy, one that is not too hard, and containing enough lead to make it free cutting.

In order to obtain the orange color seen on a good globe valve, the casting is plunged into water while hot. If the above mixture is used a good color will be obtained.

NEW BOOKS.

Microscopic Analysis of Metals. F. Osmond and J. E. Stead. 178 pp. Illustrated. J. B. Lippincott & Co., Philadelphia.

There is no subject in the study of metals which is receiving as much treatment as metallography, and any treatise which increases our knowledge along this line must certainly be welcomed. Messrs. Osmond and Stead stand at the head in this line of work, and a treatise written by them indicates accurate and thoroughly trustworthy information. The book treats the microscopic analysis of metals and alloys in a method which may be readily understood and gives directions for the preparation of the specimen. The non-ferrous metals and alloys are treated, as well as steel and iron, and to those who are taking up the study of the microscopic examination of metals we cheerfully recommend it. It is the best treatise on the subject which has yet appeared.

A peculiar custom exists in the flat ware industry. Nearly all plated spoons and forks are now made on a base metal of German silver and, as this alloy is quite difficult to make, flaws are an almost inseparable feature of the German silver industry. The custom exists among the flat ware makers that if a flaw is found in the metal, the maker of it shall pay for the labor expended in the piece up to the time such a flaw is found.

The Philadelphia Commercial Museum has decided to maintain a branch office and an information bureau in the Manufacturers' Building at the St. Louis Fair. The office will be for the convenience of visiting merchants from abroad and will contain classified lists of American manufacturers and statistics relating to the trade industries of the United States.

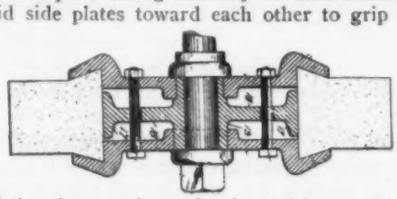
John S. King, for many years business manager of the *Iron Age, The Metal Worker* and *Carpentry and Building*, died at his home in Brooklyn on March 4, at the age of sixty-three. After having served with distinction during the entire Civil War, Mr. King came to New York and was associated with Mr. David Williams in the business management of the various publications issued by The David Williams Company.

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

745,378. Dec. 1, 1903. ELECTROLYTIC REFINING OF ZINC. Heinrich Paweck, Vienna, Austria-Hungary.—The electrolytic process herein described of depositing zinc by electrolyzing in a bath containing zinc salts, conductive salts and boron compounds, substantially as described.

750,653. Jan. 26, 1904. ABRASIVE WHEEL. David B. Hyde, Springfield, Ohio. (Safety Emery Wheel Company).—The combination, with a composition abrasive annulus, of side plates adapted to grip the annulus laterally and support the same against inward thrust, a sleeve to which one of said side plates is secured, the other plate fitting movably on said sleeve, means for drawing said side plates toward each other to grip the annulus

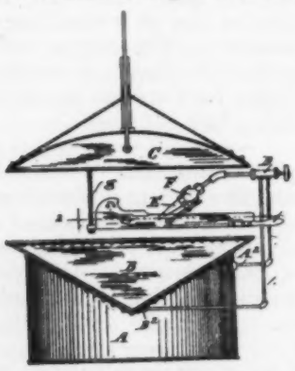


and to hold the plates and annulus in position on the sleeve, and a spindle fitting said sleeve and provided with means for clamping said sleeve thereon, said sleeve being provided with a central radial annular projection against which the inner surface of the abrasive annulus bears and by which the central portion thereof is supported, substantially as described.

750,828. Jan. 26, 1904. TOOL FOR DRESSING EMERY-WHEELS. John Desmond, Urbana, Ohio, assignor to himself, Charles H. Stephan, George W. Stephan, and Henry Stephan, Urbana, Ohio, a copartnership doing business under name of Desmond-Stephan Manufacturing Company.—A tool for dressing emery-wheels and

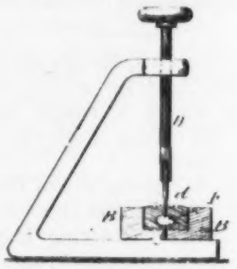
similar wheels comprising a tubular casing of a substantially rigid metal of the character described, a body molded in said casing so as to fill the same, said body being composed of a binder and an abrasive distributed with substantial uniformity throughout the body, a stop-sleeve mounted on said tubular casting and movable longitudinally relatively thereto, and means for clamping said stop-sleeve in adjusted position on said tubular casing, substantially as described.

749,179, Jan. 12, 1904. APPARATUS FOR GRINDING OR POLISHING METALS.—Lorin C. Forwood, Decatur, Ill. In an apparatus of the class described, the combination of an air-reservoir, a sand-box, a mixing-valve communicating with said air-reservoir and



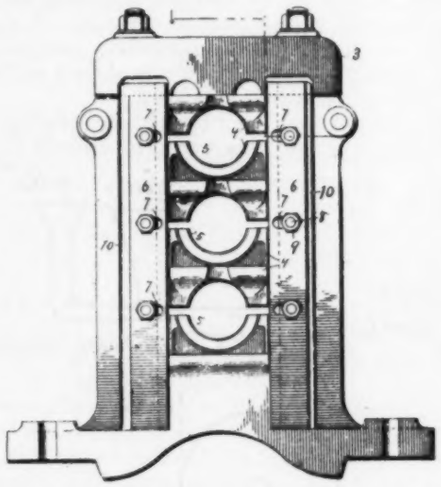
sand-box, a nozzle-valve communicating with said mixing-valve and provided with a valve-operating device, and a cradle mounted to engage with the valve-operating device of the nozzle-valve, as set forth.

751,180. Feb. 2, 1904. PROCESS OF MAKING DIAMOND DRAW-PLATES. Friedrich Krause, Jersey City, N. J.—The process herein described of making diamond draw-plates, which consists in boring a small recess in line with the central axis of the stone, then supporting it in a mold at diametrically opposite points, said points being arranged in the line connecting the central axis with the recess, then casting metal around the stone with the exception of the part forming the recess, then removing the stone with



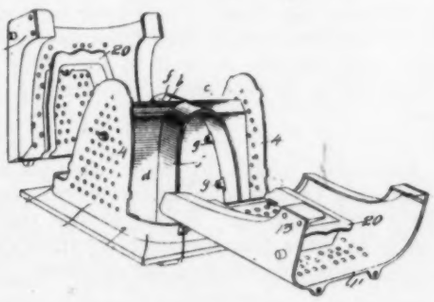
the incasing metal from the mold after the metal has cooled, and then drilling a hole through the stone in line with the recess and the central axis of the stone, substantially as set forth.

750,810. Feb. 2, 1904. SECURING MEANS FOR REMOVABLE JOURNAL BOXES. Victor Chartener, Pittsburg, Pa., assignor to A. Garrison Foundry Company, a corporation of Pennsylvania.—A housing, a removable journal-box therein, and means secured to



the exterior of the housing and overlapping the journal-box to prevent the removal of the latter, said means being mounted so as to be moved from the path of the removal of the box while still secured to the housing.

753,471, March 1, 1904. MOLDER'S FLASK.—Mortimer A. Clapp, Poughkeepsie, N. Y. In combination with a molder's flask, comprising a nowel having end walls, and cheek-pieces to close against the end walls of the nowel, a brace connecting said end



walls and having converging sides and side boards secured to the said brace and co-acting therewith to form a hollow space in the flask to reduce the capacity of the same and correspondingly reduce the quantity of sand required to fill it.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

The R. B. Seidel Philadelphia Black Lead Crucible Works, at 1344 Callowhill street, report a heavier demand for crucibles.

The Waterbury-Farrel Foundry and Machine Company, of Waterbury, Conn., have increased their capital from $100,000 to $400,000.

Owing to their increasing business the Goodwin & Kintz Company, Winsted, Conn., have increased their capital stock from $24,000 to $50,000.

Joseph Nunn, who organized the Nunn Brass Company, of Rochester, N. Y., in 1890, died at his home in that city on February 27, aged 76 years.

Part of the new plant of the Rome Metal Company, Rome, N. Y., is in operation rolling sheet copper. The rest of the new buildings are partially finished.

The National Brass and Iron Works, of Reading, Pa., report that the damage to their plant by fire on the evening of February 27 has been entirely repaired.

The Lanyon Zinc Company, of St. Louis, Mo., are rolling zinc into strips any width, length or gauge. The strips are suitable for use by jewelers and silversmiths.

The New Departure Manufacturing Company, of Bristol, Conn., are having plans drawn by Frank Stater for a new power plant which is to be equipped with turbines.

The American Graphophone Company, of Bridgeport, Conn., have under consideration the erection of a foundry for the purpose of making brass and aluminum castings.

The Canada Corundum Company, Limited, of Toronto, Canada, announce that their new mill is completed, and that they are now able to supply the wants of all customers.

The New Jersey Tube Company, Newark, N. J., have bought seven acres of land on the Erie Railroad in Harrison, N. J., to build a seamless brass and copper tube plant.

The James A. Spargo Wire Company, of Rome, N. Y., have let the contract for a two-story additional brick building which will give the company 5,000 square feet more of space.

The Mohawk Smelting Company, of Utica, N. Y., will by May 1 move to Fulton street, in that city, where they will occupy a whole building 200 x 40 feet. The company smelt white metals.

The Phillips Insulated Wire Company, of Pawtucket, R. I., have under consideration the erection of a copper rod and wire mill, but have not as yet definitely decided whether or not to build.

Gustafson Manufacturing Company, of Chattanooga, Tenn., who operate a car-wheel foundry and a brass foundry, have put in a line of pattern-making machinery specially built for making car-wheel patterns.

The Excelsior Brass Works have been incorporated at Reading, Pa., with a capital of $10,000 to succeed the Excelsior Brass Foundry and Pattern Works. All kinds of brass and metal goods will be manufactured.

The Tiffin Art Metal Company, Tiffin, Ohio, expect to start their new plant early in April. They will manufacture high art metal goods and various sheet metal products. D. W. Pritchard will be general manager.

Wm. F. Anklam, secretary and treasurer of the Kenosha Brass and Iron Company, Kenosha, Wis., has retired from the company, and has been succeeded by Aloys C. Lipput, formerly of the Lipput Iron Works.

The Sterling Pin Company, of Shelton, Conn., have increased their capital stock from $20,000 to $30,000. They will manufacture a larger line of goods, but do not at present expect to increase the size of their plant.

The Morgan Construction Company, of Worcester, Mass., the well known makers of rolling mill machinery and designers of rolling mill plants, recently closed two important contracts for the installation of two of their mills in Germany.

Unger Brothers, Newark, N. J., manufacturers of jewelry and glass cutware have been incorporated with a capital stock of $600,000 fully paid up. The incorporators are: Herman Unger, Eugene Unger, P. O. Dickinson, and E. P. Beach.

The Marlou Chemical Company, of Jersey City, N. J., announce that they have the finest equipped plant in the world for the manufacture of soldering flux and tinning fluid, and that they have a large trade in Canada and England.

The Burgess Soldering Furnace Company, Columbus, Ohio, report that they have added to their line of Gem gasoline soldering furnaces which are made in all sizes for heating soldering coppers up to and including twelve pounds per pair.

The J. H. White Manufacturing Company, of Brooklyn, N. Y., have recently been incorporated with a capital of $50,000 to manufacture brass goods, including fixture trimmings, shells and castings. The company have been in business for some time.

The Plumbers' & Steamfitters' Supply Company, of Buffalo, N. Y., who have been in business for eight years, have just been incorporated with a paid-in capital stock of $75,000. The directors are: Joseph P. Fell, Albert K. Sage and George A. Jeffrey.

The New Haven Clock Company, New Haven, Conn., informs us that the statement published that they were to put up a new building is incorrect. The company recently bought a piece of property—40 feet—which lay between two of their buildings.

The A. E. Holaday Manufacturing Company, New Haven, Conn., have added a two-story building to their plant to be used as a machine shop. The company manufacture electrical supplies, and will increase their capital stock from $20,000 to $50,000.

Clum & Atkinson, of Rochester, N. Y., report that business was slack through the winter, but is now picking up. They have one of the largest brass foundries in the State of New York, and make a variety of brass castings. They sell several grades of alloys.

The Caille Brothers Company, of Detroit, Mich., who have the largest coin operating machine plant in the world, will build a new foundry in the course of a few months which will be 100 x 150 feet. The company report that their business is increasing very rapidly.

The Aluminum and Bronze Casting Company, Cleveland, Ohio, formed by R. C. Koblitz, W. F. Henderson and F. B. Nieprask, have opened a foundry at 1174 Hamilton street, where they will make copper, brass, bronze and aluminum castings and the Diamond bearing metal.

The office and stock room of the Bailey-Farrell Manufacturing Company have been moved into their new building, Third avenue and Ross street, Pittsburg, Pa. The company's shops are at Rankin, Pa. where they have recently built a new brass plant.

McKenna Brothers' Brass Company, Pittsburg, Pa., are handing out as paper-weight souvenirs a green lacquered lizard marked "McKenna Tool Steel." The company are also furnishing large quantities of brass railings for the St. Louis Exposition.

The Rudolph and Summerill Tubing Company, of Philadelphia, Pa., issue a small card to which is attached samples of their tubing. They manufacture tubing in brass, copper, tin, bronze, aluminum, German silver and other metals in any size between one inch and 1-1000.

The Columbia Smelting and Refining Company will move their New York City office and store room by May 1 to 365 West street, where they will occupy an entire building and surrounding property, which includes ten city lots. They will continue to operate their Brooklyn smelting plant.

The Kenworthy Engineering and Construction Company, Waterbury, Conn., report that they are busily engaged in completing some large contracts among which is a copper wire scaling furnace with steel chimney for the plant of the Phillips Insulated Wire Company, Pawtucket, R. I.

The Riverside Metal Company, of Riverside, N. J., report that they are busy in their foundry with some large government contracts. They also manufacture German silver and phosphor bronze in sheet, rod and wire. They make jewelers' bars and alloys and Wessell's non-tarnishing alloys.

On the back of a postal card issued by J. Nassauer, 467 Broadway, New York, agent for the Illinois Pure Aluminum Company, there is printed matter about the company's goods arranged in the form of a trade journal and entitled *The Amuminum Notion Monthly*, the smallest trade paper in the world.

The King Lubricator and Brass Supply Company, Steubenville, Ohio, have been incorporated with a capital of $50,000. They manufacture "King" lubricators and other goods connected with the brass supply trade, having fourteen patented specialties of their own. They are equipping a factory in order to supply the trade.

The Lalance & Grosjean Manufacturing Company, of No. 19 Cliff street, New York City, make a line of enameled ware particularly suitable for platers' use. Trays and evaporating dishes are made in various sizes, and this company issue a circular on "Flint Enameled Ware" which will interest every plater.

The Cowles Electric Smelting & Aluminum Company, of Lockport, N. Y., are selling quantities of silicon copper for making pure copper castings. It is difficult to make pure copper castings without the use of this flux, the method of casting and using of which was described in THE METAL INDUSTRY for January, 1903.

The Empire Metal Company, of Syracuse, N. Y., have perfected a process for the production of phosphor tin, by which they claim the highest possible percentage of phosphorus is retained in the tin. Their brand known as the "Imperial" is produced especially for the use of brass founders in making phosphor bronze and light thin brass castings.

The Susquehanna Foundry and Machine Company, Watsontown, Pa., who were recently incorporated, have succeeded the Modern Manufacturing and Plating Company, of Philadelphia, in their machine and plating business and also the foundry business of Pardee-Snyder & Co., of Watsontown. They will manufacture brass and iron hardware.

The Roberts Chemical Company, of Niagara Falls, N. Y., are putting up their caustic potash in different sized drums containing 100, 200 and 800 pounds. Also in carboys containing 70 pounds. The Roberts Company are the only manufacturers of high grade caustic potash in the United States. Their product is especially suitable for platers' use.

The Easton Brass and Machine Works, Easton, Pa., have been incorporated with a capital stock of $5,000. W. J. Kuebler is president; R. O. Magee, vice-president, and George B. Sherry, secretary and treasurer. They will manufacture and sell brass goods such as refrigerators, hardware and a general line of steam fitters' and plumbers' goods.

The New York Buff Company have taken another loft in their present factory building at 85 Centre street, New York. With this extra space the company will utilize all of the ground floor as a store, have their shop above and use the basement as a store room. They manufacture platers' and polishers' supplies, and expect to occupy their enlarged quarters by May 1.

George G. Blackwell, Sons & Co., Limited, of Liverpool, England, inform us that they can supply nickel alloys either in the form of wire, sheets, ingots or wire rods, the alloys being made in the form of copper nickel or ferro-nickel or any other form required. The alloys they manufacture are malleable and soft, and are especially suitable for the manufacture of resistance wires.

In the five-story building occupied by J. H. Jolley & Co., 42 North Fifth street, Philadelphia, Pa., there is kept every variety of metal needed by the brass founder and finisher, including various alloys and brands of ingot metal; also sheet, rod, wire, tubes, rivets, burrs, etc., in every form demanded by the trade. J. H. Jolley & Co. are also refiners of spelter, having a special brand marked "Joliet +."

The Edmonds-Metzel Manufacturing Company, of Chicago, Ill., state that they are now settled in their new factory at 159 S. Jefferson street, where their facilities for production are greatly increased. The company manufactures hardware and electrical specialties, and do general electro-plating and experimental work. They report a very brisk business, with prospects of a larger trade throughout 1904.

The Vitrified Wheel Company, of Westfield, Mass., are making a line of corundum wheels intended especially for grinding brass, bronze and aluminum. This company use the Craig Mine Corundum, the purest known, and which is far superior to emery in hardness. The results obtained with wheels made by The Vitrified Company indicate that they are cognizant of the exact requirements of the brass foundry and finishing room.

The cornerstone of the new building of Tiffany & Co., at Fifth avenue and Thirty-seventh street, was laid on March 29 in presence of the trustees of the company, viz.: Charles T. Cook, Paulding Farnham, George F. Kunz, Louis C. Tiffany, John C. Moore, Charles L. Tiffany, Jr., Chas. M. Moore, Alfred Mitchell and Harry Treadwell. Among the articles placed in the cornerstone was a piece of the first Atlantic cable laid in 1858.

A miniature garment hanger was recently put on the market by the Wire Goods Company, Worcester, Mass., as a souvenir and has been taken hold of by the 5 and 10-cent stores and sold in quantities. The Wire Goods Company manufacture a line of bathroom fixtures of nickel-plated brass wire. They are large manufacturers of wire specialties because of their complete assortment of machinery for heading, bending and threading all kinds of wire.

Metal Prices, April 5, 1904

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	28.50
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	13.25
Electrolytic	13.12½
Casting	13.00
SPELTER—Duty 1c. per lb.	
Western	5.20
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.65
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	8.25
Halletts	7.00
Other	6.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.57
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask	47.50

Sheet Lead, 7¾c. per lb., 20 per cent. off.
Lead Pipe, 6¾c. per lb., 20 per cent. off.
Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 7.00c. per lb., open, 7.50c. per lb.
Tobin Bronze—Rods, Unfinished, 19c.
Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent.	19c.
5 per cent.	19½c.
7½ per cent.	20½c.
10 per cent.	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.00c.	12.00c.
Copper Wire	10.50c.	11.50c.
Light Copper	9.50c.	10.00c.
Heavy Mach. Comp.	9.50c.	10.50c.
Heavy Brass	7.25c.	8.25c.
Light Brass	5.50c.	6.50c.
No. 1 Yellow Brass Turnings	6.50c.	7.25c.
No. 1 Comp. Turnings	8.00c.	9.00c.
Heavy Lead	4.10c.	4.30c.
Zinc scrap	3.75c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅝ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, April 5, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb	23c.
Lighter than 10 oz	24c.
10 oz. and up to 12 oz	26c.
12 oz. and up to 14 oz. to square foot, per lb	29c.

Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order. Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16	.23½	.27½	.31½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¼ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

												Per lb
Plain	Round	Tube,	¾	in.	up	to	2	in.,	to	No.	19,	inc.	$0 35
"	"	"	⅞	"	"		3¼	"		"	19,	"	36
"	"	"	1⅛	"	"		3⅝	"		"	19,	"	38
"	"	"	1⅜	"	"		4	"		"	19,	"	41
"	"	"	1⅝	"	"		4⅜	"		"	19,	"	48
"	"	"	1¾	"	"		5	"		"	19,	"	65
"	"	"	2	"	"		5¾	"		"	19,	"	1 06
"	"	"	2⅛	"	"		6¼	"		"	19,	"	1 50
Smaller than ⅛ inch													Special
2 inch to 3 inch, to No. 19, inclusive													38
3 inch													40
Over 3 inch to 3½ inch													45
Over 3½ inch													50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than.. And Including..	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Polishing One Side.	Sat. Fin. without Lacquer. One Side.
No. 13 & heavier	42	44	44	44	44	44	47	47	48	48	49	50	2	6
" 14	42	44	44	44	44	44	47	47	48	48	49	50	2	6
" 15	43	44	44	44	44	44	47	47	48	48	49	50	2	6
" 16	43	44	44	44	44	44	47	47	48	48	49	50	2	6
" 17	43	44	44	44	44	44	47	47	48	48	49	50	2	6
" 18	43	44	44	44	44	44	47	47	48	48	49	50	2	6
" 19	44	46	46	46	46	46	48	48	49	49	50	51	2	6
" 20	46	46	46	46	46	46	48	48	49	49	50	51	2	6
" 21	46	46	46	46	46	46	48	48	49	49	50	51	2	6
" 22	46	46	46	46	46	46	48	48	49	49	50	51	2	6
" 23	47	47	47	47	47	47	48	48	49	49	50	51	2	6
" 24	47	47	47	47	47	47	48	48	49	49	50	51	2	6
" 25	48	48	48	48	49	49	50	50	51	51	52	53	2	6
" 26	48	48	48	48	51	51	52	52	53	53	54	55	2	6
" 27	49	50	50	50	52	52	53	53	54	54	55	56	2	6
" 28	50	52	52	52	53	53	54	54	55	55	56	57	2	6
" 29	52	54	54	54	54	54	55	55	56	56	57	58	2	6
" 30	54	56	56	56	56	56	57	57	58	58	59	60	2	6
" 31	55	57	57	57	57	57	58	58	59	59	60	61	2	6
" 32	56	58	58	58	58	58	59	59	60	60	61	62	2	6
" 33	57	59	59	59	59	59	60	60	61	61	62	63	2	6
" 34	58	60	60	60	60	60	61	61	62	62	63	64	2	6
" 35 & 36	60	62	62	62	62	62	63	63	64	64	65	66	2	6
" 37 & 38	62	64	64	64	64	64	65	65	66	66	67	68	2	6
" 39 & 40	64	66	66	66	66	66	67	67	68	68	69	70	2	6
".008" to .0015"	66	68	68	68	68	68	69	69	70	70	71	72	2	6
Less than .0015"	68	70	70	70	70	70	71	71	72	72	73	74	2	6
Not wider than 6 in.													2	6
*3 in. in coils.	43	43	43	43	43	43	44	44	45	45	46	47	2	6
1-2 to 3-4	43	43	43	43	43	43	44	44	45	45	46	47	2	6
1 to 2	43	43	43	43	43	43	44	44	45	45	46	47	2	6
Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.	66	66	66	66	66	66	67	67	68	68	69	70	2	6

All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds					10 per cent. off list.
1,000 to 2,000 "	10	per cent. and	2	"	"
2,000 to 4,000 "	10	" "	3	"	"
4,000 pounds and over	10	" "	5	"	"

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3-8	.....	.....	.....	12	9	8	7	3-8
1-2	.....	.....	17	14	11	9	8	1-2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	.....1 00
1 1-4	.....	.....	36	30	25	.....	.....	.....1 1-4
1 1-2	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4	.....	60	50	41	33	.....	.....	.....1 3-4
2	84	68	58	47	37	.....	.....	.....2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.

30,000 lbs. and over, four cents off list.